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The patterns and prevalence of hand osteoarthritis in a population of disabled older women: The Women's Health and Aging Study

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Summary

Objective: To describe the prevalence of hand osteoarthritis (OA) by joint site, joint count and severity in a representative population of older disabled women.

Methods: 1002 moderately to severely disabled women aged ≥65 years were selected from a representative population of community-dwelling women. Hand OA was established using a reproducible algorithm based on self-reported pain, standardized physical examinations, hand photographs, and physician questionnaire responses. OA was categorized as either symptomatic disease, intermittently symptomatic/asymptomatic disease, possible disease, or no disease.

Results: Symptomatic OA, requiring the presence of hand pain on most days for at least 1 month, occurred in approximately 23% of disabled older women in each age group, and most reported pain in the moderate to severe range. The prevalence of intermittently symptomatic/asymptomatic OA was higher with increasing age. Finally, the most commonly affected hand OA sites were the distal interphalangeal (DIP) and the first carpometacarpal (CMC1) joint groups.

Conclusion: These findings demonstrate the very high prevalence of clinical hand OA in disabled older women and show that a large proportion of hand OA results in substantial symptoms. © 2000 OsteoArthritis Research Society International

Key words: Prevalence, Hand osteoarthritis, Disabled older women.

Introduction

Despite differences in radiographic versus clinical case definitions, several consistent patterns of hand OA have been documented in representative populations. The joints most characteristically involved, in decreasing order of frequency, include the distal interphalangeal (DIP), proximal interphalangeal (PIP), and the first carpometacarpal (CMC1) joint groups.[1] Radiographically-defined hand OA has been found to increase in frequency with age,[1–4] up to the mid-eighth decade, when a plateau phenomenon occurs.[5–7] Prevalence of hand joint complaints also shows a similar plateau.[8] A few studies addressing the association of hand OA with hand function or self-reported disability have been undertaken,[9–11] however, little information is available on how hand OA manifests in a disabled population. The authors describe the prevalence of clinical hand OA, and its presentation by joint site, joint count and pain severity in a representative population of community-dwelling, disabled older women.

Methods

STUDY POPULATION

The data for this analysis were collected as part of the Women's Health and Aging Study (WHAS), a longitudinal study designed to determine the causes and course of physical disability in the one-third most disabled older women living in the community. The study sampling frame and participation have been detailed previously.[12] Briefly, Medicare enrollment files were the basis for an age-stratified random sample of women aged ≥65 years, from the Eastern Baltimore and Baltimore County area (N=6521). Of these, 5316 were located and living in the community, and 4137 participated in a screening interview to assess physical and cognitive function. Women reporting difficulty in at least one task in two or more of the following

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domains of disability were classified as having moderate to severe disability:[12–14] mobility (walking a quarter of a mile, walking up 10 steps without resting, getting in and out of bed or chairs, doing heavy housework); upper extremity ability (raising arms over head, lifting and carrying 10 lbs, using fingers to grasp); basic self care (bathing, using the toilet, dressing, eating); higher functioning tasks (using the telephone, doing light housework, preparing meals, shopping). On the basis of the screening interview, 1409 women were found to have moderate to severe disability and no severe cognitive impairment (Mini Mental Status Examination score >17[15]). Of these, 1002 women agreed to participate in a comprehensive interview and physical examination.[12] Twenty-eight percent of study participants were black and nearly all of the remainder were white.[14]

Baseline evaluations were performed in participants' homes and consisted of an interviewer-administered questionnaire, a research-focused physical examination conducted by a trained nurse using standardized protocols, phlebotomy, and hand photographs. Each joint in the following joint groups were examined: the DIP, PIP and CMC1 joints, where the thumb interphalangeal (IP) joint was included as a PIP joint. Disease surveillance questionnaires were completed by participants' primary care physicians and included questions on the presence, severity and year of diagnosis of hand osteoarthritis (OA) to supplement the process for ascertaining disease.

Hand photographs were obtained as follows, using a modification of the techniques developed by Acheson *et al.*[16] The participant's hands were placed, palm down and side by side on a board covered with blue cloth, which was placed in the woman's lap. A 35-mm camera was positioned 14 inches directly above the hands and a photograph was taken. Each digit of the following joint groups were read for the presence or absence of bony prominence or deformity: DIP, PIP and thumb IP and CMC1 joints. One trained reader read one half of the hand photographs; a second trained reader read the other half of the photographs; and a subset were re-read by one of the readers.

The presence of hand OA was determined using a decision algorithm[17] modeled on the American College of Rheumatology classification criteria,[18] but expanded to include classifications for intermittently symptomatic or asymptomatic disease (see Fig. 1). Reliability studies for this algorithm indicated excellent reproducibility (κ=1.00).[17] Hand OA classification was based on self-reported hand pain, physical examination findings, and readings of hand photographs, and was supplemented, as needed, by primary physician questionnaire responses regarding the presence of hand OA.

Based on the algorithm, OA was categorized as either definite symptomatic or intermittently symptomatic/asymptomatic disease, possible disease, or no disease. The symptomatic OA group (N=232) consisted of individuals with (a) pain, aching or discomfort of the hands on most days for at least one month of the 12 months preceding the baseline study evaluation, (b) physical examination findings of OA, which consisted of bony enlargement of three or more of the 10 sentinel hand joints for OA (bilateral second and third DIP and PIP joints, and the CMC1 joints),[18] and had to include bony enlargement of at least two DIP joints, or (c) hand photograph findings consisting of bony prominence of ≥2 DIP, PIP and thumb IP joints, or (d) diagnosis based on physician questionnaire. Individuals with intermittently symptomatic or asymptomatic OA (N=387) had no hand pain, or had symptoms only on a minority of days during at least 1 month in the prior year, plus either (a) hand photograph evidence of OA, or (b) OA as determined from physician questionnaire. A small group of individuals (N=56) was designated as having possible OA based on the presence of hand pain on most days for ≥1 month, but inconclusive or unsupportable findings on physical examination, hand photograph, or physician questionnaire. Finally, 327 individuals had no evidence of hand OA.

In addition to the self-reported pain question used in the algorithm, information on the degree of pain was sought. Participants who stated that they had any pain during the month prior to their baseline examination (even if it did not occur on most days of the month) were asked to indicate the level of pain on a visual analogue scale (VAS) ranging from 0 (none) to 10 (severe/excruciating, as bad as you can imagine).

Physical findings of hand OA were defined as follows. Bony changes consisted of the presence of either bony enlargement on physical examination or bony prominence on the hand photograph. Pain/tenderness in a joint consisted of either pain on passive range of motion, or tenderness on palpation elicited during the physical examination.

DATA ANALYSIS

Except for the age-specific prevalence estimates, all results for those ≥65 years were weighted to adjust for the age-stratified sampling design and for non-response.[19] For the joint-specific frequencies of bony changes or joint pain/tenderness, less than 2% of the data were missing for any of the joint sites. For these analyses, missing values were imputed as 'unaffected'.

Results

The age-specific prevalence of symptomatic hand OA was approximately 23% of women for each age group (Table I). However, the age-specific prevalence of intermittently symptomatic/asymptomatic OA increased in older age-groups, reaching a frequency of 51% in women age ≥85 years (Table I). Table II shows the joint-specific prevalence of OA features among the 232 women with symptomatic hand OA. The prevalence of either bony changes or joint pain/tenderness in the right hand ranged from 55 to 89% for the DIP joints, from 29 to 56% for the PIP joints, and was 66% for the CMC1 joints.

For the most part, the frequency of bony enlargement was higher at the second and third rays, while the frequency of pain or tenderness (18–33%) was similar for most IP joints for the symptomatic hand OA group (Table II). The presence of bony changes was responsible for the majority of OA features for all DIP and both CMC1 joints in women with symptomatic hand OA. For the intermittently symptomatic/asymptomatic OA subgroup, the frequency of bony changes, pain or tenderness was about 20% in each fifth PIP joint, and 14% in each thumb IP joint, nearly two-thirds and one-half the frequency for the symptomatic OA cases (data not shown). The frequency of involvement for all other joint groups in the intermittently symptomatic/asymptomatic OA subgroup was similar to that for the symptomatic OA subgroup.

The cumulative frequencies of joints with bony changes, or joint pain/tenderness were high. In individuals with definite hand OA (either symptomatic or intermittently

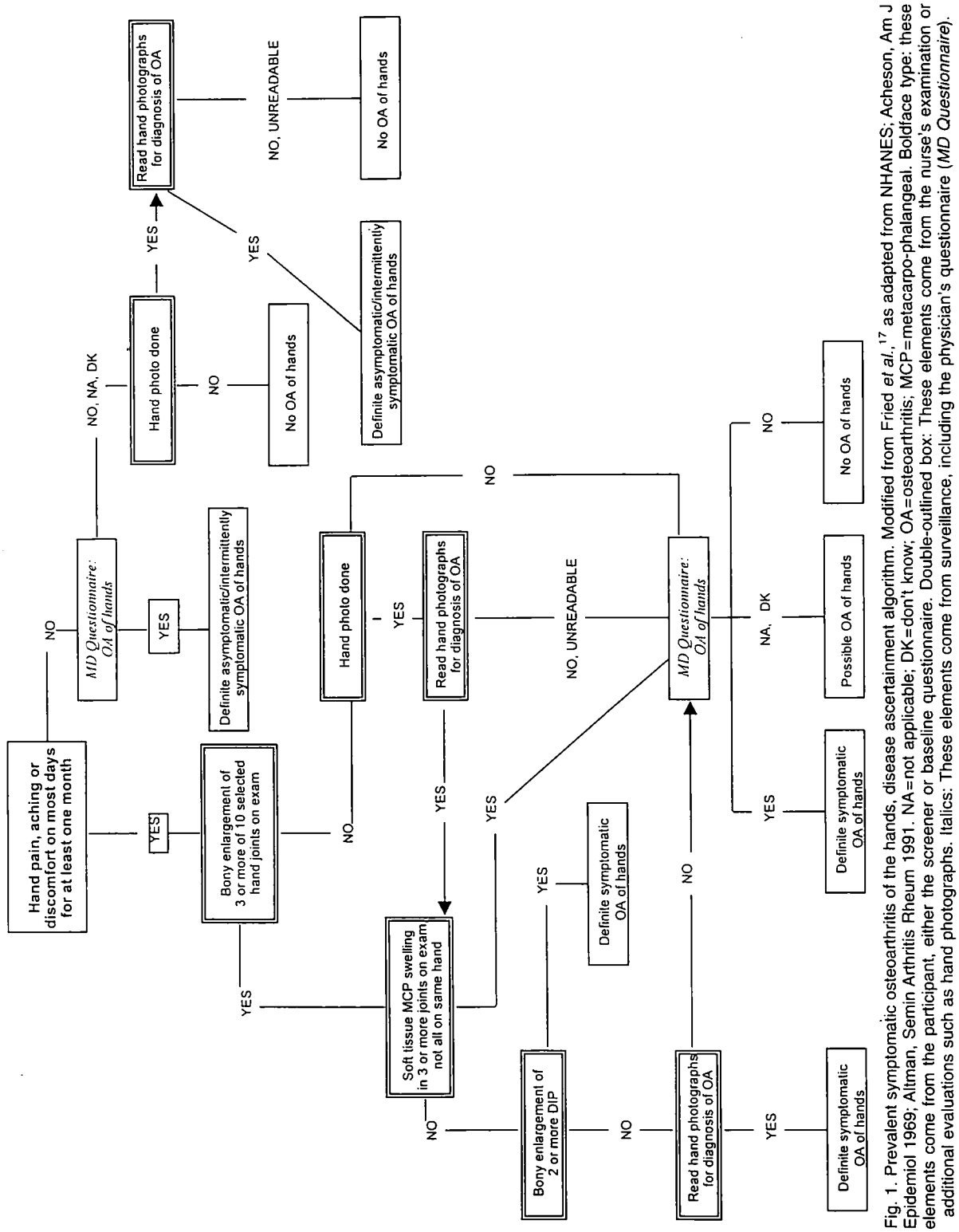

Fig. 1. Prevalent symptomatic osteoarthritis of the hands, disease ascertainment algorithm. Modified from Fried *et al.*,[17] as adapted from NHANES; Acheson, Am J Epidemiol 1969; Altman, Semin Arthritis Rheum 1991. NA=not applicable; DK=don't know; OA=osteoarthritis; MCP=metacarpo-phalangeal. Boldface type: these elements come from the participant, either the screener or baseline questionnaire. Double-outlined box: These elements come from the nurse's examination or additional evaluations such as hand photographs. Italics: These elements come from surveillance, including the physician's questionnaire (*MD Questionnaire*).

Table I
Age-specific prevalence (%) of hand osteoarthritis (OA) in the WHAS I population, N=1002

Age group	No/possible OA	Intermittently symptomatic/ asymptomatic OA	Symptomatic OA
	N=383	*N*=387	*N*=232
65–74	47	29	24
75–84	39	39	22
≥85	27	51	23

WHAS: Women's Health and Aging Study.

Table II
Joint specific prevalence (%) of osteoarthritis physical features of the right hand among 232 moderately to severely disabled women age ≥65 years with symptomatic hand osteoarthritis in the WHAS

Ray and joint group	Bony changes prevalence (%)	Exam pain/tenderness prevalence (%)	Either bony changes or exam pain/ tenderness prevalence (%)
1 Thumb IP	8	24	29
CMC1	55	32	67
2 DIP2	89	23	89
PIP2	28	26	45
3 DIP3	66	22	70
PIP3	39	33	56
4 DIP4	46	18	55
PIP4	21	25	38
5 DIP5	65	19	69
PIP5	19	22	36

IP: interphalangeal; DIP: distal interphalangeal; PIP: proximal interphalangeal; CMC1: first carpometacarpal; WHAS: Women's Health and Aging Study.

symptomatic/asymptomatic), one-third had bony changes in all eight DIP and four or more PIP joints. One-half of these individuals had both CMC1 joints affected and two-thirds had four or more DIP, one or more PIP and one CMC1 joint with bony changes. In the women with symptomatic OA, nearly 50% had one or more DIP, and two or more PIP joints involved and 40% had unilateral CMC1 joint involvement (data not shown).

In the total WHAS population, 32% of women reported hand pain, aching or discomfort on most days for at least a month, and 49% reported having some hand pain (even if not on most days) during the month prior to examination. Figure 2 presents the findings for self-reported severity of hand pain experienced during the month prior to study entry using a 10-point VAS for pain. The pain severity frequencies for women with intermittently symptomatic/ asymptomatic OA were similar to those with no or possible OA, with approximately 60% reporting no pain (mean±S.D.= 1.2±2.2). Most women with symptomatic hand OA reported pain in the moderate to severe range, with approximately 50% rating their pain as 4–7 (mean±S.D.= 5.6±2.7), on a scale of 10. Although by definition women with symptomatic hand OA had pain, aching or tenderness on most days for at least 1 month *in the prior 12 months*, approximately 10% reported no pain *in the month prior to the study*. Approximately 10% of the women with no/possible OA reported severe pain in the month prior to the study, however, other musculoskeletal conditions which were not ascertained in the study may account for this finding.

Discussion

The WHAS algorithm for symptomatic hand OA was derived from the American College of Rheumatology classification tree format for clinical hand OA,[18] but also takes into consideration intermittently symptomatic or asymptomatic disease. The addition of these cases is supported by the findings of other researchers. Spector *et al.* found that only 6% of women aged 45–65 years fulfilled the criteria for symptomatic hand OA, yet about 14% of others had some hand pain in the month prior to examination, and 43% fulfilled the physical examination criteria with or without a history of pain.[20] Aspelund *et al.* noted similar findings in a geriatric population.[21]

The overall prevalence of clinical hand OA (symptomatic plus intermittently symptomatic/asymptomatic disease) was 59%, and that for symptomatic hand OA was 23% (weighted estimates across each of three age strata: 65–74 years; 75–84 years; and ≥85 years). The symptomatic hand OA prevalence in this disabled population was over three times higher than that of women in another geriatric population unselected on disability status where the same disease definition was used.[21] The prevalence of hand joint complaints in a representative sample of Swedish 85-year-old women was on the same order of magnitude as symptomatic hand OA in women of the same age in the WHAS population.[6] However, the number of Swedish women with clinical OA findings was not reported and the pain question was less restrictive, reflecting current or ever

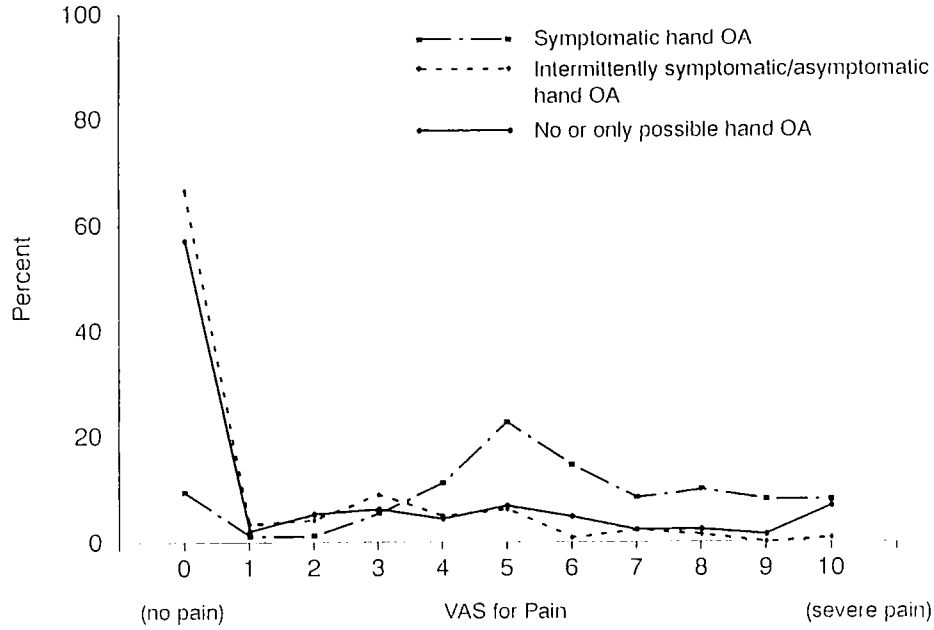

Fig. 2. Distribution of self-reported pain in the month prior to examination by visual analogue scale for pain according to hand OA status, among moderately to severely disabled women aged ≥65 years. VAS=visual analog scale.

pain in the past, rather than pain on most days for at least 1 month. To our knowledge, the severity of hand pain in the geriatric population has not been addressed. In disabled older women in WHAS with symptomatic disease, the majority had pain in the moderate to severe range, based on a VAS for pain.

Studies of radiographic or physical examination features of hand OA, and those investigating hand symptoms in the geriatric population, have shown a plateau effect in prevalence in the mid-eighth decade.[5,6,8,22] Yet in the WHAS population, the prevalence of symptomatic plus intermittently symptomatic/asymptomatic hand OA continued to rise with increasing age, whereas the prevalence of symptomatic disease alone remained constant. These latter findings suggest that an excess of symptomatic OA in the younger women may be due to selection of the population on the basis of disability.

The clinical findings of IP joint OA in this population followed a similar pattern to that in other studies. DIP bony changes were more common than PIP bony changes. In comparison to the frequency of bony changes in other joints in the hand, bony changes were more common in the thumb base, and second and third digits, reflecting the same pattern of involvement as the 10 sentinel OA joints in radiographic studies.[18,23] However, the frequency of CMC1 bony changes in the WHAS population was higher than PIP joint bony changes, a finding seen in several other,[5,24] but not most studies of geriatric populations.[6,7,21,25]

A potential limitation of this study was the absence of a physical examination for Bouchard's nodes, which may have affected the relative order of the frequency of bony changes in the PIP and CMC1 joints. Also, the clinical studies of hand OA[6,20–22] used for comparison to our study were based on physical examination data, and OA assessments based on hand photographs[16] have not been widely applied. When OA bony changes in this study were re-analyzed with only the physical examination data, the cumulative percent of ≥1 involved DIP joints was about 5% lower, and that for ≥1 involved CMC1 joints was about 11% lower than those described in the results.

In summary, the joint-group specific frequency of clinical features of IP joint OA in the WHAS population followed a similar pattern to that in other studies, including the relative frequency of bony changes in the 10 sentinel OA joints in relation to the remainder of hand joints. However, the CMC1 joint, as opposed to the PIP joint group, was the second most commonly affected hand site. And unlike the findings of a mid-eighth decade plateau of hand OA prevalence in other representative populations, the prevalence of intermittently symptomatic/asymptomatic clinical hand OA increased with age in moderately to severely disabled older women. Approximately 23% of older disabled women had evidence of clinically-defined, symptomatic hand OA in each age group, and most reported pain in the moderate to severe range. Thus, a substantial proportion of older women with disability were found to be affected by symptomatic hand OA.

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